

Our Docket No.: 42390P88

PATENT

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## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Anne E. Miller

Application No.: 09/715,690

Filed: November 16, 2000

For: COPPER POLISH SLURRY FOR  
REDUCED INTERLAYER  
DIELECTRIC EROSION AND  
METHOD OF USING SAME

Examiner: Umez-Eronini, Lynette T.

Art Group: 1765

## DECLARATION UNDER 37 CFR 1.132

I, ANNE E. MILLER, do hereby declare and say:

1. My home address is 15021 NW Wendy Lane, Portland, Oregon.
2. I have a B.S.E. degree in Chemical Engineering from Princeton University in Princeton, New Jersey, a M.S. in Materials Engineering from Stevens Institute of Technology in Hoboken, New Jersey, and a Ph.D. in Ceramic Science from Rutgers University in New Brunswick, New Jersey.
3. I worked at Bell Laboratories as an engineer for 15 years. I presently work for Intel Corporation as an engineer, and I have worked for Intel Corporation for the past 5 years in the field of Chemical Mechanical Polishing.
4. I am the sole inventor in the above referenced application.
5. I have reviewed the application, including the claims of the application, and I have also reviewed a copy of the current claims that are pending.

09/715,690

-1-

Our Docket No.: 42390P88

PATENT

6. I have been given a copy of U.S. Patents 5,954,997 (the '997 patent) and 6,083,419 (the '419 patent) and I have carefully studied them. I am completely familiar with and fully understand the disclosure of both the '997 patent and the '419 patent.

7. The corrosion inhibitors including cetyltrimethylammonium hydroxide, tricaprilmethylammonium chloride, and tetramethylammonium hydroxide and mixtures thereof as taught by the '419 patent for the use in a chemical mechanical polishing slurry for tungsten would not be used in a copper polish slurry, such as the one taught in the '997 patent. This is because copper and tungsten have different oxidation and corrosion properties. Based on this observation, in my professional opinion, one of ordinary skill in the art at the time of the invention would not understand the '419 patent to suggest the use of the above corrosion inhibitors, and in particular cetyltrimethylammonium hydroxide that contains alkyltrimethylammonium cations, in a copper polish slurry as taught in the '997 patent.

8. The results obtained from experiments where alkyltrimethylammonium cations in the form of cetyltrimethylammonium bromide (CTAB) were added to a copper polish slurry are attached hereto as Exhibit A. These results were obtained from experiments performed before November 16, 2000, the filing date of the patent application.

9. The results presented in the graph of Exhibit A were unexpected and thus render the use of a surfactant containing alkyltrimethylammonium cations in a copper polish slurry non-obvious. The results showed a reduction in the patterned erosion rate of an interlayer dielectric material by an order of magnitude. The patterned erosion rate was around 4000 Ang/min when a copper polish slurry without a surfactant was used and the erosion rate was around 400 Ang/min when 0.5 weight percent of CTAB was added to the copper polish slurry. Such a dramatic decrease in the patterned erosion rate after the addition of a surfactant containing alkyltrimethylammonium cations was unexpected. This is particularly true in light of the facts that surfactants containing alkyltrimethylammonium cations are (1)

Our Docket No.: 42390P8842

PATENT

not typically used in copper polish slurries and (2) cause the flocculation, or destabilization, of a silica-based copper polish slurry having the claimed formulation.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patents issuing thereon.

Signed:

Date: 6/16, 2003

Anne E Miller  
ANNE E. MILLER

# EXHIBIT A

Rate vs. % CTAB addition



## Rate vs. % CTAB addition

